

above the threshold the signal is directed to the second stage amplifier. This system is somewhat limited in its application since it views the input signal as being simply low power or high power. Furthermore, it is inefficient in hardware terms because of the requirement to construct two amplifier stages, although only one will ever be used at any time.

In accordance with a first aspect of the present invention, a power amplifier system comprises a control circuit; a power amplifier and a delay circuit; wherein the control circuit comprises a detector for detecting an instantaneous power level of an input signal; a threshold comparator; and a power supply voltage source; wherein the threshold comparator is provided with a plurality of preset thresholds; wherein the threshold comparator compares the detected power level with the preset thresholds; wherein the power supply voltage is switched according to the output of the threshold comparator; and wherein the delay device delays the input signal to the power amplifier to enable the power supply voltage to be adapted to the detected power level, such that the efficiency of the power amplifier is optimised.

The present invention provides an efficient linear power amplifier in which the power supply voltage to the amplifier is changed according to the threshold reached by the detected input signal power level. Multiple thresholds are preset and associated with a suitable power supply voltage. This is a flexible system which provides a significant improvement in efficiency over conventional systems.

Preferably, the power supply voltage source comprises a plurality of preset power supply voltages associated with respective power level thresholds.

The system may be operated with two preset thresholds, but preferably, at least three preset thresholds are provided.

Preferably, at least four preset power supply voltages are provided.

Preferably, the system further comprises a pulse shaping filter.

Preferably, the power amplifier is a Class B amplifier and a filter is provided at the output of the amplifier to reconstitute the amplified input signal.

In accordance with a second aspect of the present invention, a code division multiple access (CDMA) communication system comprises a power amplifier according to the first aspect.

CDMA systems use radio waves which have varying amplitudes, but the present invention is able to cope with this whilst maintaining efficiency of the amplifier by switching the power supply voltage according to the input signal power level.

In accordance with a third aspect of the present invention, a method of  
 5 operating a power amplifier system comprises detecting an instantaneous power level of an input signal; comparing the detected power level with a plurality of preset thresholds; switching a power supply voltage according to the output of the comparison; and delaying the input signal to the power amplifier to enable the power supply voltage to be adapted to the detected power level, such that the efficiency of the  
 10 power amplifier is optimised.

Preferably, a plurality of power supply voltage levels associated with respective power level thresholds are preset.

An example of a power amplifier system in accordance with the present invention will now be described with reference to the accompanying drawings in  
 15 which:

Figure 1 is an example of a power supply system according to the present invention;

Figure 2 illustrates variation in input power for an input signal using the system of Fig. 1; and

20 Figure 3 illustrates the corresponding variation in power supply voltage for the power amplifier of the system of Fig. 1.

Figure 1 shows one example of a power amplifier system 1 according to the present invention. An amplitude variant source signal 2, containing information that is  
 25 to be transmitted, is input to the system. The signal follows a first path to a power amplifier 3 via a control circuit. The control circuit comprises an envelope detector 4, which provides a value that is proportional to the instantaneous power of the input signal 2. This value is applied to a threshold detector 5 which has N, in this case 3, preset thresholds, although more can be set if appropriate. An output of the threshold  
 30 detector 5 controls switching of a switch unit 6 between N+1, in this case 4, discrete power supply voltages for the power amplifier. The chosen voltage then passes through a pulse shaping filter 7 to the power amplifier 3. The signal follows a second path to the power amplifier via a time delay 8, so that the power supply voltage of the

CLAIMS

1. A power amplifier system, the system comprising a control circuit; a power amplifier and a delay circuit; wherein the control circuit comprises a detector for  
5 detecting an instantaneous power level of an input signal; a threshold comparator; and a power supply voltage source; wherein the threshold comparator is provided with a plurality of preset thresholds; wherein the threshold comparator compares the detected power level with the preset thresholds; wherein the power supply voltage is switched according to the output of the threshold comparator; and wherein the delay device  
10 delays the input signal to the power amplifier to enable the power supply voltage to be adapted to the detected power level, such that the efficiency of the power amplifier is optimised.
2. A power amplifier system according to claim 1, wherein at least three preset  
15 thresholds are provided.
3. A power amplifier system according to claim 1 or claim 2, wherein the power supply voltage source comprises a plurality of preset power supply voltages associated with respective power level thresholds.  
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4. A power amplifier system according to claim 3, wherein at least four preset power supply voltages are provided.
5. A power amplifier system according to any preceding claim, wherein the  
25 system further comprises a pulse shaping filter.
6. A power amplifier system according to any preceding claim, wherein the power amplifier is a Class B amplifier and wherein a filter is provided at the output of the amplifier to reconstitute the amplified input signal.  
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7. A CDMA communication system comprising a power amplifier according to any preceding claim.

8. A method of operating a power amplifier system, the method comprising detecting an instantaneous power level of an input signal; comparing the detected power level with a plurality of preset thresholds; switching a power supply voltage according to the output of the threshold comparator; and delaying the input signal to the power amplifier to enable the power supply voltage to be adapted to the detected power level, such that the efficiency of the power amplifier is optimised.
9. A method according to claim 8, wherein a plurality of power supply voltage levels associated with respective power level thresholds are preset.